Overland Storage

SnapSAN™ S5000 AutoCache

User Guide

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Preface

This user guide explains how to install, setup, and use your new SnapSAN AutoCache for Windows software to analyze the causes of lowered responses in the disk array subsystem and improving its performances. This guide assumes that you are familiar with computer hardware, data storage, and network administration terminology and tasks. It also assumes you have basic knowledge of Internet SCSI (iSCSI), Serial-attached SCSI (SAS), Serial ATA (SATA), Storage Area Network (SAN), and Redundant Array of Independent Disks (RAID) technology.

This guide assumes that you are familiar with computer hardware, data storage, and network administration terminology and tasks. It also assumes you have basic knowledge of Internet SCSI (iSCSI), Serial-attached SCSI (SAS), Serial ATA (SATA), Storage Area Network (SAN), and Redundant Array of Independent Disks (RAID) technology.

Product Documentation and Firmware Updates

Overland Storage SnapSAN product documentation and additional literature are available online, along with the latest release of the SnapSAN S5000 AutoCache User Guide software.

Point your browser to:

http://docs.overlandstorage.com/snapsan

Follow the appropriate link to download the **latest** software file or document. For additional assistance, search at http://support.overlandstorage.com.

Overland Technical Support

For help configuring and using your SnapSAN S5000, search for help at:

http://support.overlandstorage.com/kb

You can email our technical support staff at techsupport@overlandstorage.com or get additional technical support information on the Contact Us web page:

http://www.overlandstorage.com/company/contact-us/

For a complete list of support times depending on the type of coverage, visit our web site at:

http://support.overlandstorage.com/support/overland_care.html

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Conventions

This user guide exercises several typographical conventions:

Convention	Description & Usage
Boldface	Words in a boldface font (**Example**) indicate items to select such as menu items or command buttons.
Ctrl-Alt-r	This type of format details the keys you press simultaneously. In this example, hold down the **Ctrl** and **Alt** keys and press the **r** key.
NOTE	A Note indicates neutral or positive information that emphasizes or supplements important points of the main text. A note supplies information that may apply only in special cases—for example, memory limitations or details that apply to specific program versions.
IMPORTANT	An Important note is a type of note that provides information essential to the completion of a task or that can impact the product and its function.
CAUTION	A Caution contains information that the user needs to know to avoid damaging or permanently deleting data or causing physical damage to the hardware or system.
WARNING	A Warning contains information concerning personal safety. Failure to follow directions in the warning could result in bodily harm or death.
Menu Flow Indicator (**>**)	Words in bold font with a greater than sign between them indicate the flow of actions to accomplish a task. For example, **Setup > Passwords > User** indicates that you should press the Setup button, then the Passwords button, and finally the User button to accomplish a task.

Information contained in this guide has been reviewed for accuracy, but not for product warranty because of the various environments, operating systems, or settings involved. Information and specifications may change without notice.

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Contents

Preface

Chapter 1 - L2 Cache

Purpose of L2 Cache 1-1
L2 Cache Types 1-2
L2 Cache Configuration 1-2
L2 Cache Examples 1-3
Improving Response 1-3
Reducing Operational Cost 1-3

Chapter 2 - L2 Cache Function

L2 Cache Settings 2-1
Operations of L2 Cache Settings 2-2
Number of physical disks and physical disk capacity 2-3
Select Physical Disks 2-4
Pool Name 2-7
Navigation button(s) 2-8
Change of L2 Cache Settings 2-10
L2 Cache On/Off for Each Logical Disk 2-12
Operations of L2 Cache Information Display 2-13
SnapSAN Manager Main Window 2-13
Operations of L2 Cache Performance Analysis 2-14

Chapter 3 - L2 Cache Function Installation

System Configuration 3-1
Related Products 3-1
Software Installation 3-2

Chapter 4 - L2 Cache Operation

Initial Configuration 4-1
Confirming Effects of Read Cache Installation 4-2
Confirming Effects of Write Cache Installation 4-6
Checking for the Read Cache Usage 4-9
Checking for the Write Cache Usage 4-10
Expanding the Capacity 4-11
Handling When L2 Cache Is Degraded 4-12

Appendix A - Notes

Notes for L2 Cache A-1
Licenses A-1
Apache License A-1

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Flex License A-1

Index

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L2 Cache

Purpose of L2 Cache

This chapter describes the L2 cache basics. L2 cache is a cache placed on an SSD which has high random access performance. By introducing an L2 cache into a disk array, response when random access concentrates in the storage can be improved.

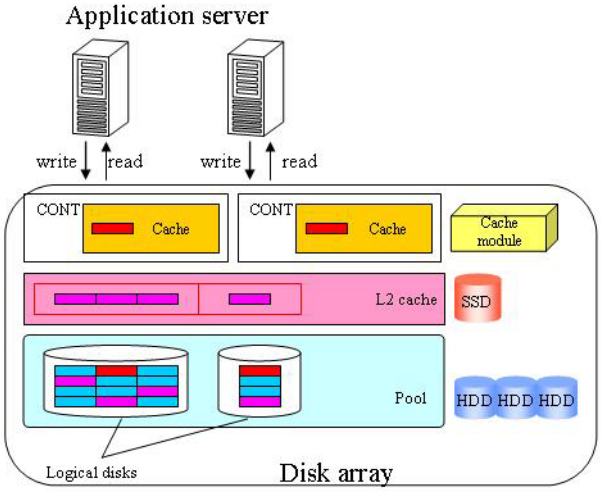

Figure 1-1: L2 Cache

An L2 cache of the storage is used as a read cache, write cache, or persistent write described below:

- Read Cache Data that is frequently read by random access is stored in an L2 cache. If the data does not exist in the L1 cache (*1) when a read request for this data is made again, this data is read from the L2 cache that is faster to access than HDD (Hard Disk Drive). The L2 cache of this type is effective for operations involving a lot more data reads than writes, such as those with indexes of a database or a boot drive in a virtual desktop environment.
- Write cache When a lot of write requests are issued, the response to a write request is improved by moving unwritten data existing in cache to the L2 cache instead of writing it in HDD.
- Persistent write When a controller is degraded due to a failure, the cache usually enters write-through (*2) state to maintain the data integrity, and the response to a write request will be decreased. By using the L2 cache function, the cache of the failed controller is substituted by the L2 cache. This prevents the response to a write request from being decreased if a failure occurs.

(*1)The L1 cache means a cache that is bound to the cache module.

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(*2)The mode of processing which writes data in the physical disk, while simultaneously writing data in the cache.

L2 Cache Types

When binding an L2 cache, select either of the following types for the L2 cache type.

- Read/Write: An L2 cache can be used as a read cache, write cache, or persistent write.
- Read only: An L2 cache can be used as a read cache or persistent write.

The characteristics depending on the L2 cache configuration.

Type	Redundancy	Required SSDs	Capacity To Be Decreased	Fault Tolerance
Read/Write	Duplication	Two or more	Half	• When one SSD went down, the L2 cache cannot be used continuously as a write cache, but it can be used continuously as a read cache or persistent write. • When two or more SSDs went down, the L2 cache cannot be used continuously.
Read only	None	One or more	None	When one or more SSDs went down, the L2 cache cannot be used continuously.

We recommended selecting "(1) Read/Write" for the L2 cache type with the emphasis on fault tolerance.

L2 Cache Configuration

An L2 cache is made up of an L2 cache pool that is configured on SSD, and logical disks for L2 cache that are bound in the L2 cache pool. By installing the L2 cache function to a disk array, an L2 cache pool and logical disks for L2 cache are bound. The following figure shows a configuration example when an L2 cache is bound.

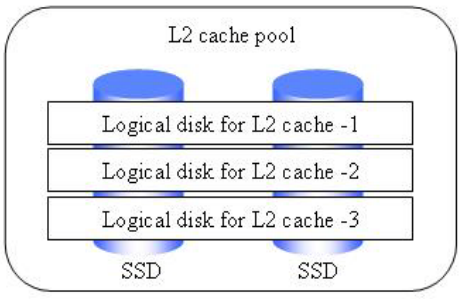

Figure 1-2: L2 Cache Configuration

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L2 Cache Examples

Improving Response

Previously, there were situations where operations centered on random access increased loads of HDD disks thereby having lowered response.

If you apply an L2 cache to such operations, the response can be improved with HDD disks being accessed due to cache hit miss less frequently.

Reducing Operational Cost

Regarding operations for which high response is required even when heavily loaded, it has been a traditional method to evenly use as many HDD disks as possible to distribute loads. However, with this method requiring a large number of HDD disks for load distribution, a major problem was that the power consumed during operations increased, having raised the operational cost.

If you apply an L2 cache to operations like the above, you can improve response by adding a few SSD disks, instead of installing many additional HDD disks. Compared with load distribution over HDD disks, the use of L2 cache not only needs fewer additional physical disks, but also saves power with physically moving parts being reduced, thus enabling a substantial reduction in the operational cost.

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L2 Cache Function

L2 Cache Settings

The L2 cache function is divided into the following three:

- L2 cache settings
- L2 cache information display
- L2 cache performance analysis

L2 cache settings involve the following functions:

L2 cache bind

Use this function to create an L2 cache. When L2 cache bind is executed, an L2 cache pool and logical disks for L2 cache are configured, and operation using the L2 cache is started.

L2 cache unbind

Use this function to free the L2 cache. When L2 cache unbind is executed, the L2 cache pool and the logical disks for L2 cache are freed.

Change of L2 cache settings

Use this function to stop and restart the L2 cache function, and to change the nickname of the L2 cache pool or the logical disks for L2 cache.

Set on/off the L2 cache for each logical disk

Use this function to make the L2 cache enabled or disabled for each logical disk.

When executing the L2 cache unbind, it is necessary to make an L2 cache function stop by the change of L2 cache settings beforehand.Because the operation of the L2 cache stops when making an L2 cache function stop, the response of I/O sometimes declines.The initial nicknames of the L2 cache pool and the logical disks for L2 cache are set according to the following naming rules:

L2 cache pool: Poolxxxx_L2CHE

logical disks for L2 cache: Poolxxxx_L2CHE_yyyy

xxxx: Pool number

yyyy: Logical disk number

It is recommended to operate the L2 cache without changing the initial nicknames in order to make it identifiable as L2 cache by the nickname. If you want to change the initial nicknames, assign nicknames by which the L2 cache can be identified.

L2 cache configuration can be performed through the configuration setting on the SnapSAN Manager client (GUI), or using SnapSAN Manager ControlCommand. However, the L2 cache on/off setting for each logical disk can be performed only through the configuration setting on the SnapSAN Manager client (GUI). The following table shows the menus and commands used for L2 cache configuration.

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Function	Configuration Setting on SnapSAN Manager client (GUI)	SnapSAN Manager ControlCommand
L2 cache bind	[Configuration] - [L2 Cache] - [L2 Cache Bind]	SnapSAN Managercfg l2cachebind
L2 cache unbind	[Configuration] - [L2 Cache] - [L2 Cache Unbind]	SnapSAN Managercfg l2cacheunbind
Change of L2 cache settings (Change a nickname)	[Configuration] - [L2 Cache] - [Change of L2 Cache Settings]	SnapSAN Managercfg nickname
Change of L2 cache settings (Stop and restart the L2 cache)	[Configuration] - [L2 Cache] - [Change of L2 Cache Settings]	SnapSAN Managercfg setl2cacheattr
L2 cache on/off for each logical disk	[Configuration] - [Logical Disk] - [Logical Disk Operation] - [Change Settings]	Not supported

L2 Cache Information Display

The L2 cache information display function is capable of displaying the configuration information about the L2 cache. Use this function when checking the configuration or state of the L2 cache.

L2 Cache Performance Analysis

The L2 cache performance analysis function is capable of displaying the performance information about the L2 cache. Use this function when checking effects or capacity shortage of the L2 cache.

Operations of L2 Cache Settings

This section describes how to set up an L2 cache by using configuration setting on the SnapSAN Manager client (GUI). For details about L2 cache configuration through SnapSAN Manager ControlCommand, refer to the "Command Reference".

You can perform the following operations in relation to L2 cache:

- L2 Cache Bind
- L2 Cache Unbind
- Change of L2 Cache settings
- Set On/Off L2 Cache for Each Logical Disk

L2 Cache Bind

Create a new L2 cache.

The L2 Cache Bind screen consists of the following screens:

L2 Cache Bind

- Physical disk selection

Confirmation

- Advanced settings

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Completion

L2 Cache Bind

Set the L2 cache you want to bind.

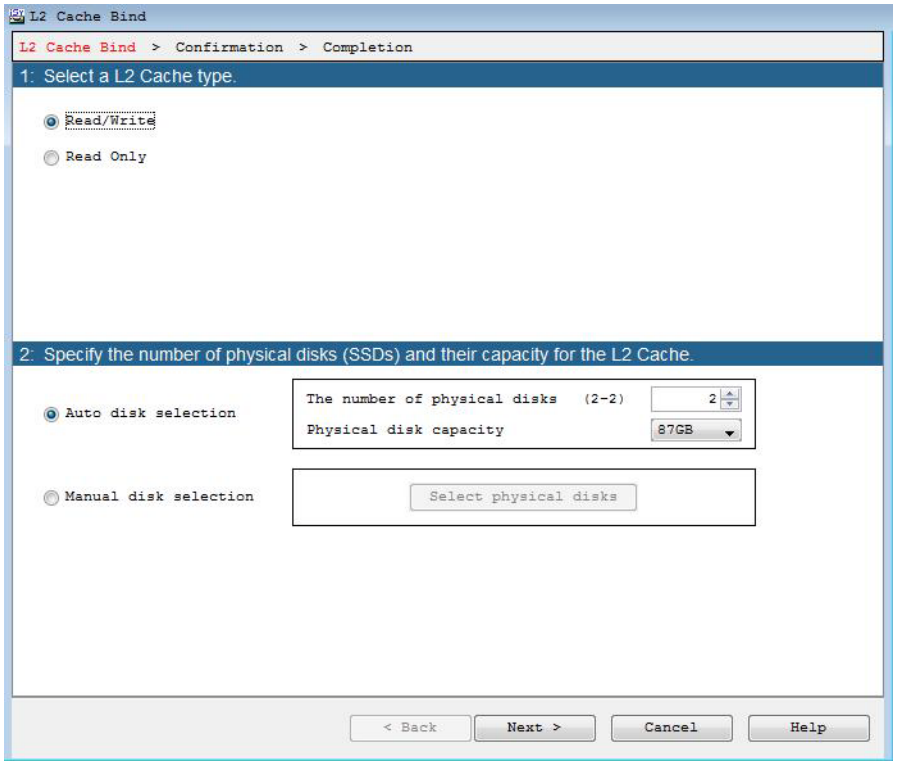

Figure 2-1: L2 Cache Set

L2 cache type selection

Select the type of the L2 cache to be bound.

- L2 cache type
  Select the type of the L2 cache. The available types are:
  - Read/Write
  - Read only

Number of physical disks and physical disk capacity

Select the physical disks to be used.

- Auto disk selection
  Select the number of physical disks to be used and the capacity per physical disk.
  The number of physical disks that can be used is:
  Read/Write:2 to 4
  Read only:1 or 2
- Manual disk selection
  If you click the [Select physical disks] button, you can manually select the physical disks to be used for the L2 cache.

Navigation button(s)

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- [Next]

The Confirmation screen is displayed.

- [Cancel]

  A dialog box is displayed that asks if you want to end the wizard. Clicking the [OK] button in the dialog box ends the wizard and displays the [Monitor] - [Screen Display] screen.
- You cannot create another L2 cache if you have already created an L2 cache.
- SSD is the only physical disk type that can be used for L2 cache.
- You cannot use any of the physical disks numbered 0 to 3 that are installed on the base of the disk array for the L2 cache.
- If, in manual disk selection, you have chosen a combination of physical disks that differ in capacity, the L2 cache is created based on the disk with the smallest capacity.
- For this reason, when you have chosen such a combination, a warning dialog box appears at the click of the [Next] button.

Select Physical Disks

Select the physical disks to be used.

The physical disk selection section can be displayed on the [List] tab or [View] tab. You can switch the display by selecting the tab at the top of the section.

On the [List] tab, the physical disks that cannot be used to create an L2 cache are not displayed in the list; on the [View] tab, the corresponding check boxes are grayed out.

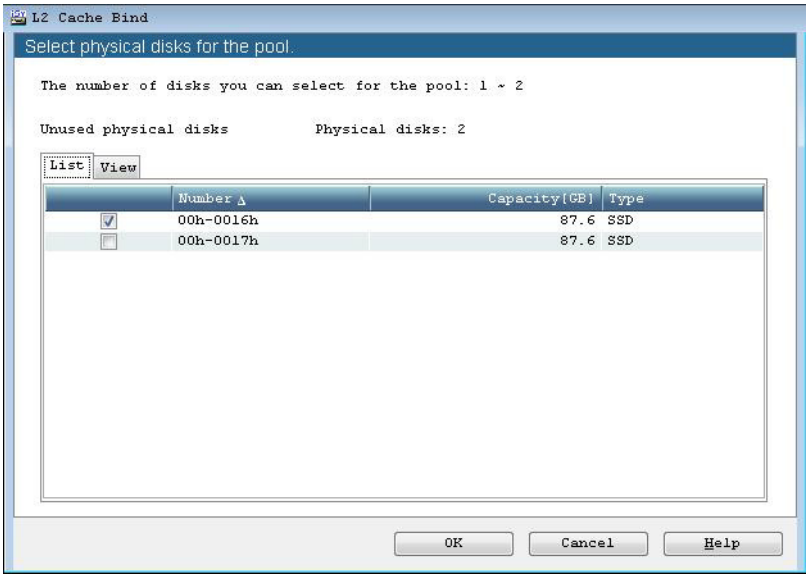

Figure 2-2: List Tab

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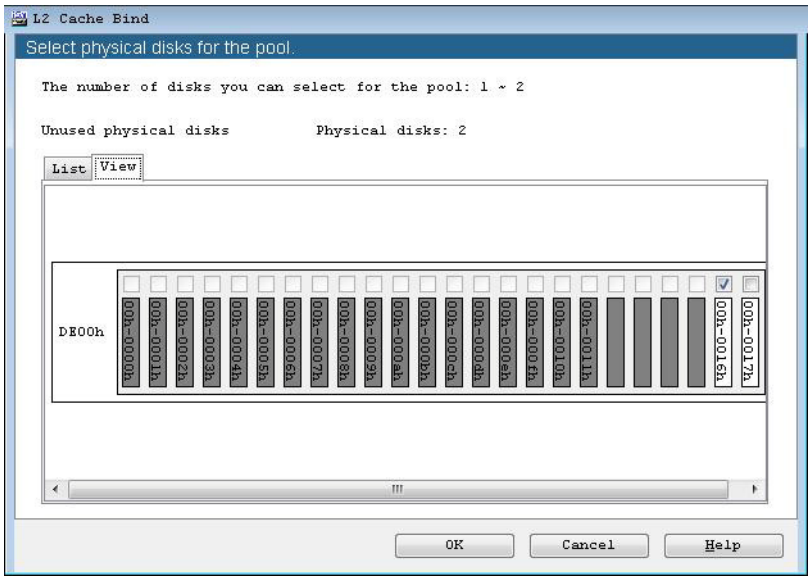

Figure 2-3: View Tab

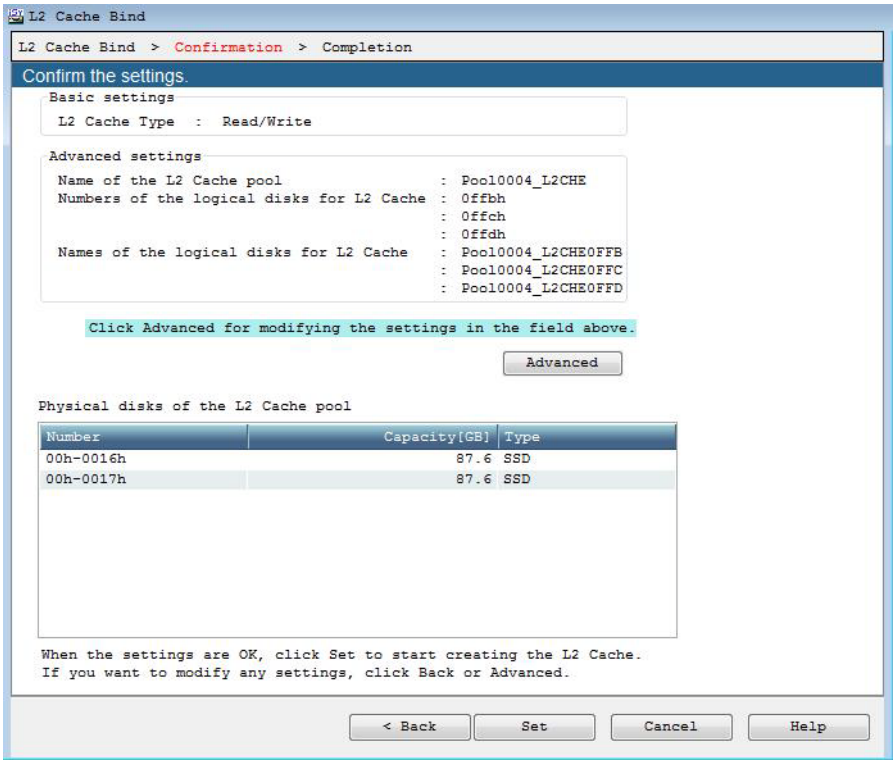
L2 Cache Bind
L2 Cache Bind > Confirmation > Completion
Confirm the settings.
Basic settings
L2 Cache Type : Read/Write
Advanced settings
Name of the L2 Cache pool : Pool0004_L2CHE
Numbers of the logical disks for L2 Cache : 0ffbh
: 0ffch
: 0ffdh
Names of the logical disks for L2 Cache : Pool0004_L2CHE0FFB
: Pool0004_L2CHE0FFC
: Pool0004_L2CHE0FFD
Click Advanced for modifying the settings in the field above.
Advanced
Physical disks of the L2 Cache pool
Number
Capacity[GB]
Type
00h-0016h 87.6 SSD
00h-0017h 87.6 SSD
When the settings are OK, click Set to start creating the L2 Cache.
If you want to modify any settings, click Back or Advanced.
< Back
Set
Cancel
Help

Figure 2-4: L2 Cache Bind Confirmation

The settings of the physical disks to be used for the L2 cache are listed.

Clicking the [Advanced] button displays the Advanced Settings screen.

Basic settings

L2 Cache Type

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Displays the configuration type of the L2 cache.

- Read/Write
- Read only

Advanced settings

The following items can be changed on the Advanced Settings screen.

Name of the L2 Cache pool

Name assigned to the special pool to which the L2 cache is allocated.

Numbers of the logical disks for L2 Cache

Number of the special logical disk corresponding to the L2 cache (Up to three numbers).

Names of the logical disks for L2 Cache

Name assigned to the special logical disk corresponding to the L2 cache (Up to three names).

Navigation button(s)

- [Set]

The following confirmation dialog box is displayed.

Figure 2-5: Confirmation Dialog Box

If you click [Yes], the L2 cache bind operation is executed and then the Completion screen is displayed.

- [Back]

The L2 Cache Bind screen is displayed again.

- [Cancel]

A dialog box is displayed that asks if you want to end the wizard. Clicking the [OK] button in the dialog box ends the wizard and displays the [Monitor] - [Screen Display] screen.

Advanced Settings

Set the advanced settings for L2 cache bind.

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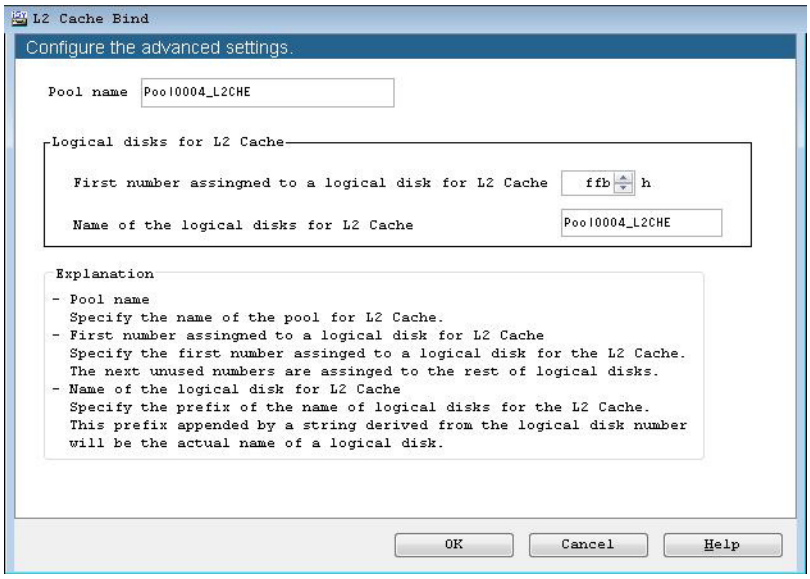
L2 Cache Bind
Configure the advanced settings.
Pool name
Pool0004_L2CHE
Logical disks for L2 Cache
First number assingned to a logical disk for L2 Cache
ffb
h
Name of the logical disks for L2 Cache
Pool0004_L2CHE
Explanation
- Pool name
Specify the name of the pool for L2 Cache.
- First number assingned to a logical disk for L2 Cache
Specify the first number assinged to a logical disk for the L2 Cache.
The next unused numbers are assinged to the rest of logical disks.
- Name of the logical disk for L2 Cache
Specify the prefix of the name of logical disks for the L2 Cache.
This prefix appended by a string derived from the logical disk number
will be the actual name of a logical disk.
OK
Cancel
Help

Figure 2-6: Advanced Settings

Pool Name

Specify a name for the L2 cache pool.

First number assigned to a logical disk for L2 Cache

Specify the number of the first logical disk. The next available numbers following the specified number are used for the subsequent logical disks.

Name of the logical disks for L2 Cache

Specify a character string common to names of up to three special logical disks corresponding to the L2 cache.

The specified name is used as the prefix of each logical disk name; the actual logical disk name is generated by appending a string derived from the logical disk number to the prefix for each logical disk.

- Specify a name for the L2 cache pool according to the rules below.

(The characters violating these rules cannot be specified.)

  - Number of usable characters 1 to 32 characters
  - Usable characters Alphabets (A to Z (a to z)) * The name is case sensitive. Number (0 to 9) Underscore (_) Slash (/)
  - * All characters must be one-byte.

- Specify a name for the logical disk for L2 cache according to the rules below.

(The characters violating these rules cannot be specified.)

- Number of usable characters1 to 24 characters
- Usable charactersAlphabets (A to Z (a to z)) * The name is case sensitive. Number (0 to 9) Underscore (_) Slash (/)
  - * All characters must be one-byte.
- An existing pool name must not be specified for the L2 cache pool.

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- It is not allowed to assign the same name to the two logical disks for L2 cache. An existing logical disk name must not be assigned, either.
- If you click the [OK] button with nothing entered in the [Pool name] field and/or [Name of the logical disks for L2 Cache] field, names are assigned automatically.

Completion

The result of the L2 cache bind is displayed.

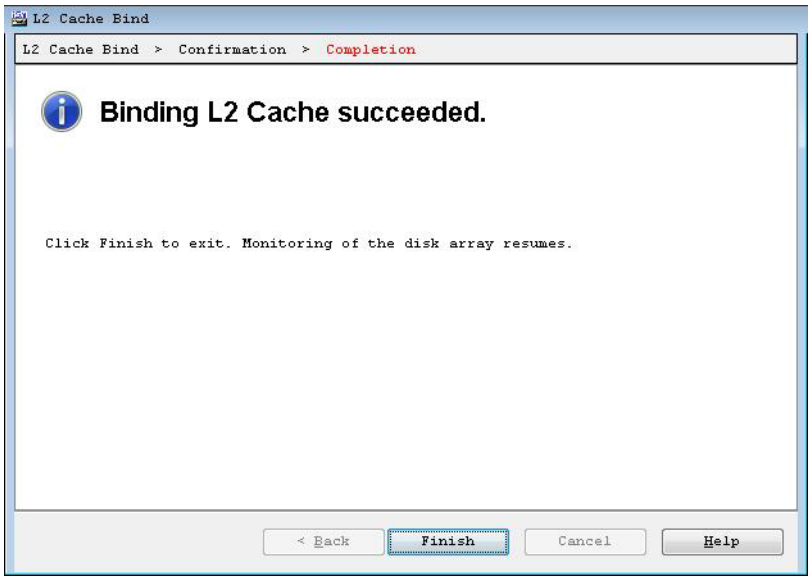

Figure 2-7: L2 Cache Bind Completion

Navigation button(s)

- [Finish]

The [Monitor] - [Screen Display] screen is displayed.

If the L2 cache bind fails, check the physical disk list on the [Monitor] - [Screen Display] screen and see if there are physical disks allocated to "L2 cache". Also, check the disk array for abnormalities.

If physical disks remain allocated to L2 cache after troubleshooting of the disk array, perform L2 caches unbind once.

L2 Caches Unbind

Release the L2 cache.

The L2 Cache Unbind screen consists of the following screens:

- L2 Cache Unbind
- Completion

L2 Cache Unbind

The L2 cache settings to be released are displayed

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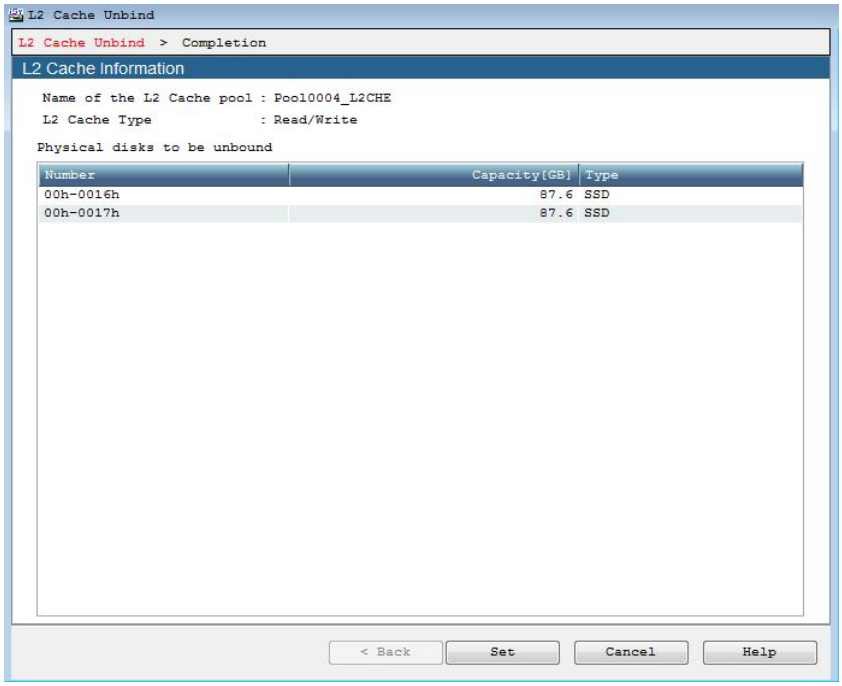

Figure 2-8: L2 Cache Unbind

The physical disks in current use for the L2 cache are listed.

When the L2 cache function is enabled or the function is being disabled, the L2 cache cannot be unbound.

It is necessary to disable the L2 cache function on the Change of Settings screen beforehand, and unbind the L2 cache when the process is complete.

Navigation button(s)

- [Set]

The following confirmation dialog box is displayed.

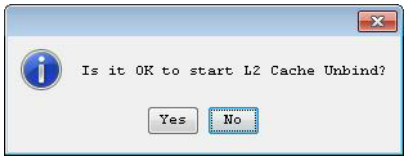

Figure 2-9: Confirmation Dialog Box

If you click [Yes], the L2 cache unbind operation is executed. When the operation is successful, the Completion screen is displayed.

- [Cancel]

A dialog box is displayed that asks if you want to end the wizard. Clicking the [OK] button in the dialog box ends the wizard and displays the [Monitor] - [Screen Display] screen.

Completion

The result of the L2 cache unbind is displayed.

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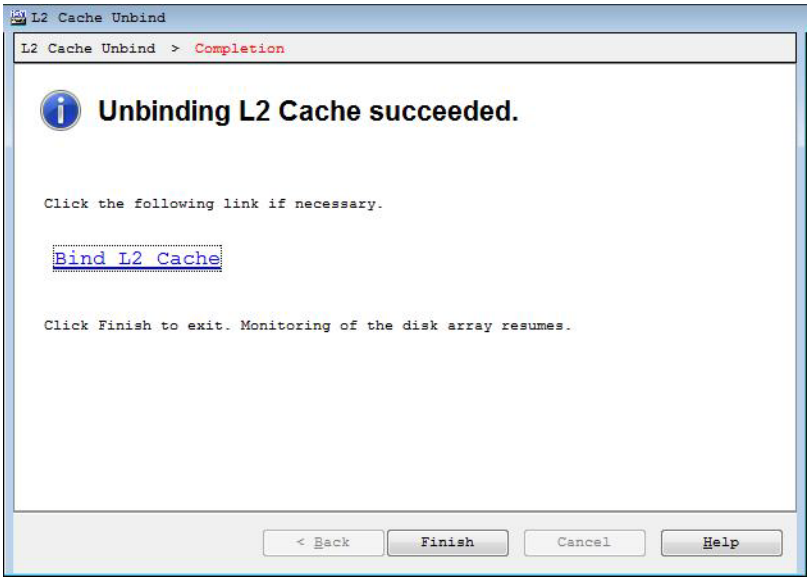

Figure 2-10: L2 Cache Unbind Completion

When this operation is successful, the following link is displayed.

Bind L2 cache

To bind an L2 cache, start the L2 Cache Bind screen.

Navigation button(s)

- [Finish]

The [Monitor] - [Screen Display] screen is displayed.

Change of L2 Cache Settings

You can change settings of the L2 cache.

The Change of Settings screen consists of the following screen.

Change of Settings

Change settings of the L2 cache.

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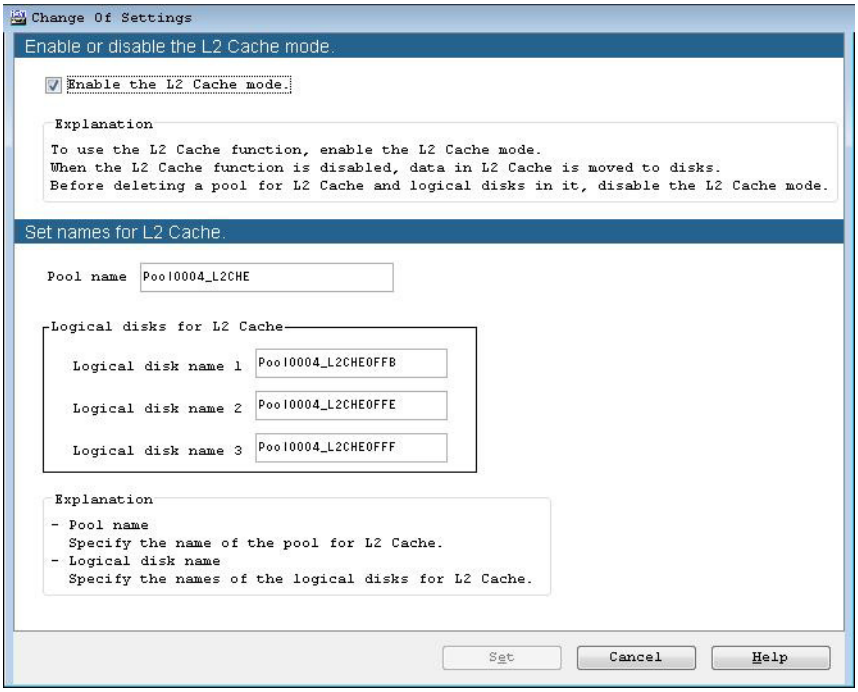
Change Of Settings
Enable or disable the L2 Cache mode.
Enable the L2 Cache mode.
Explanation
To use the L2 Cache function, enable the L2 Cache mode.
When the L2 Cache function is disabled, data in L2 Cache is moved to disks.
Before deleting a pool for L2 Cache and logical disks in it, disable the L2 Cache mode.
Set names for L2 Cache.
Pool name
Pool0004_L2CHE
Logical disks for L2 Cache
Logical disk name 1
Pool0004_L2CHE0FFB
Logical disk name 2
Pool0004_L2CHE0FFE
Logical disk name 3
Pool0004_L2CHE0FFF
Explanation
- Pool name
Specify the name of the pool for L2 Cache.
- Logical disk name
Specify the names of the logical disks for L2 Cache.
Set
Cancel
Help

Figure 2-11: Change of Settings

If you want to change the L2 cache configuration such as the number of SSDs and the L2 cache type, release the L2 cache once, and then set it in creating an L2 cache.

Enable the L2 Cache mode

By selecting this checkbox, the L2 cache function is enabled. By deselecting this checkbox, the L2 cache function is disabled and unwritten data in the write cache and persistent write cache is written to a HDD. It is necessary to disable the L2 cache function beforehand, and unbind the L2 cache when the process is complete.

"Attn. (reconstructing)" is displayed for the L2 cache status while the process to disable the L2 cache function is running.

Set names

- Pool name

  Specify a name for the L2 cache pool.

  Logical disk name 1/Logical disk name 2/Logical disk name 3

  Specify a name for up to three special logical disks corresponding to the L2 cache.
- Specify a name for the L2 cache pool according to the rules below.

(The characters violating these rules cannot be specified.)

  - Number of usable characters 1 to 32 characters
  - Usable characters Alphabets (A to Z (a to z)) * The name is case sensitive. Number (0 to 9) Underscore (_) Slash (/)
  - * All characters must be one-byte.
- Specify a name for the logical disk for L2 cache according to the rules below.

(The characters violating these rules cannot be specified.)

  - Number of usable characters1 to 24 characters

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- Usable charactersAlphabets (A to Z (a to z)) * The name is case sensitive. Number (0 to 9) Underscore (_) Slash (/)
  - * All characters must be one-byte.
- An existing pool name must not be specified for the L2 cache pool.
- It is not allowed to assign the same name to the two logical disks for L2 cache. An existing logical disk name must not be assigned, either.

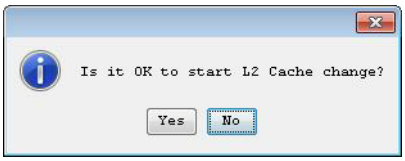

Figure 2-12: Confirmation Dialog Box

If you click [Yes], the change of L2 cache settings is executed.

- [Cancel]

The [Monitor] - [Screen Display] screen is displayed without changing the settings.

L2 Cache On/Off for Each Logical Disk

You can set on/off the L2 cache for each logical disk on the Change of Settings screen.

The Change of Settings screen consists of the following screen.

Change of Settings

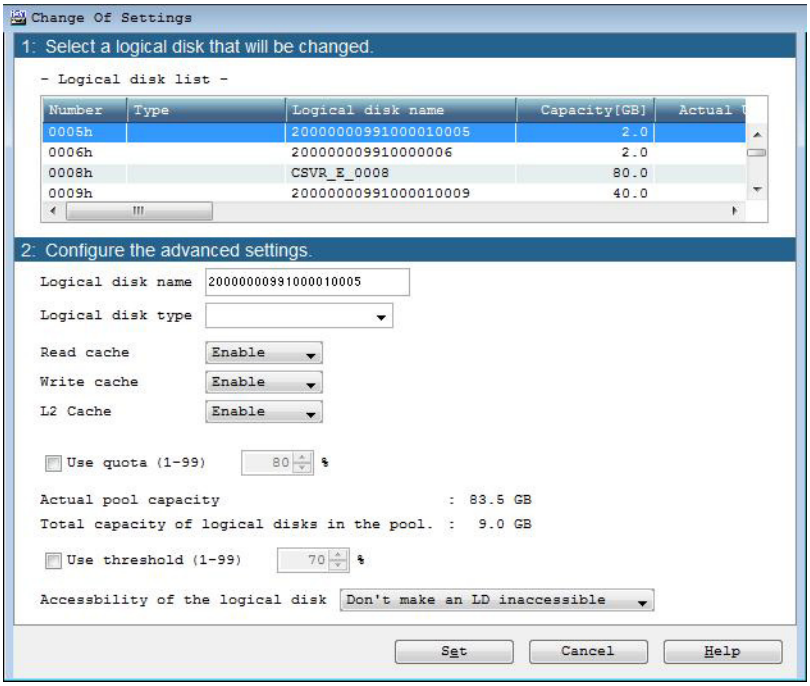

Figure 2-13: Change of Settings

Logical disk selection

Select a logical disk of which settings to be changed from the list.

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Change the settings

Change the settings as needed. For the settings other than the L2 cache settings, refer to "Configuration Setting Tool User's Manual (GUI) for the M Series".

L2 Cache

Enables or disables the L2 cache function for the selected logical disk.

Disabling the L2 cache including the logical disk that is being used less than before decreases the performance of the specified logical disk. On the other hand, the performance of other logical disks is enhanced.

The L2 cache settings of the logical disk that meets any of the following causes cannot be changed.

Cause	Description
SYV	The logical disk is a System Volume.
RSV	The logical disk is a replication reserved volume.
Snapshot	The logical disk is a base-volume (BV), snapshot-volume (SV), or snapshot data volume (SDV).
LV	The logical disk is a link-volume (LV).
MSV	The logical disk is a data migration reserved volume.
SSD	The logical disk is the one bound in SSD (including logical disks for L2 cache).

Navigation button(s)

- [Set]

The following confirmation dialog box is displayed.

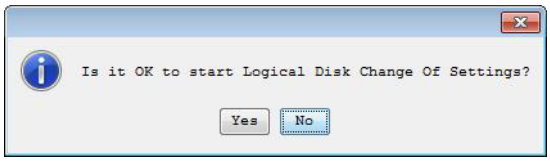

Figure 2-14: Confirmation Dialog Box

Clicking [Yes] starts changing the logical disk settings.

- [Cancel]

A dialog box is displayed that asks if you want to end the wizard. Clicking the [OK] button displays the [Monitor] - [Screen Display] screen without changing the logical disk settings.

Operations of L2 Cache Information Display

This section describes operations for displaying the information about the L2 cache.

SnapSAN Manager Main Window

The SnapSAN Manager main window on the SnapSAN Manager client displays the following information relating to the L2 cache in the disk array detail information:

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(Cache) State

Displays one of the following as the operating state of the cache modules installed in the unit.

(Cache) Total Capacity

Displays the total physical capacity of the cache modules installed in the unit.

Cache module list

Displays the information about the cache modules installed in the unit.

(L2 cache) State

Displays the operating state of the pool used for the L2 cache.

(L2 cache) Total Capacity

Displays the total capacity of physical disks used as the L2 cache.

(L2 cache) Mode

Displays the L2 cache operation mode.

Pool list

Displays the information about the pool used for the L2 cache.

Physical disk list

Displays the information about the physical disks used for the L2 cache.

(*)To judge whether or not it is an L2 cache pool with "Pool list screen" in the information list display area, refer to the "Type" column. If you want to display the "Type" column on, right-click the item name part and set the relevant item to be displayed.

Configuration Display Command (SnapSAN Managerview)

The SnapSAN Managerview command can be used to display the following information relating to the L2 cache in the disk array detail information:

(Cache) State

(Cache) Total Capacity

(L2 cache) State

(L2 cache) Total Capacity

(L2 cache) Mode

Operations of L2 Cache Performance Analysis

This section describes operations for analyzing the performance of the L2 cache. Performance Monitor and AutoTune can display the performance information relating to the L2 cache in the cache metrics.

Performance Monitor is capable of outputting the performance information about the L2 cache to a CSV file by means of a CSV conversion tool. For details about the performance information to be output to a CSV file, refer to the "Performance Monitoring User's Manual".

AutoTune is capable of displaying the following performance information in graphs.

L1/L2 cache hit ratio

Displays the ratio that read requests hit the L1 cache or L2 cache.

L2 cache page-in size

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Displays the size of the data that have been transferred from the L1 cache to the L2 cache by page-in operations.

L2 cache average dirty pages

Displays the average ratio of pages including data, which has not been written to a physical disk. among write cache pages of the L2 cache. This metrics can be displayed only when using the L2 cache of Read/Write.

L2 cache maximum dirty pages

Displays the maximum ratio of pages including data, which has not been written to a physical disk. among write cache pages of the L2 cache. This metrics can be displayed only when using the L2 cache of Read/Write.

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L2 Cache Function Installation

System Configuration

A configuration example of hardware and software components for using the L2 cache function is shown below.

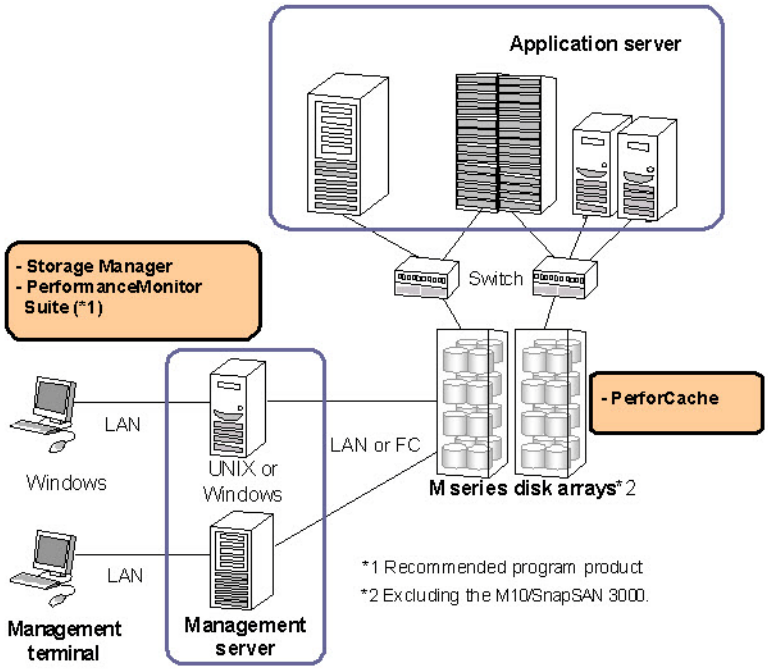

Figure 3-1: System Configuration Example

Related Products

To use the L2 cache function, the following related program products are required:

AutoCache

This is the product covered in this manual. It provides functions that use L2 cache.

SnapSAN Manager and BaseProduct

This product provides functions that monitor the state of the resources of the disk array and set up the disk array configuration.

In addition, to use the L2 cache function more effectively, the following program product is recommended:

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Performance Monitor Suite (Set of Performance Monitor and AutoTune)

This product includes the analysis function (AutoTune) in addition to the disk array performance monitor function.

Analyzing the storage performance information allows you to confirm the effects and usage of the L2 cache.

Software Installation

Before installing the L2 cache function, you need to unlock the licenses of AutoCache and the other required program products for the target disk array

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Chapter 4

L2 Cache Operation

Initial Configuration

This section describes the procedure for creating an L2 cache through configuration setting on the SnapSAN Manager client (GUI) in order to use the L2 cache in applications.

It is assumed that the licenses for AutoCache and the other required products including storage control software are unlocked already.

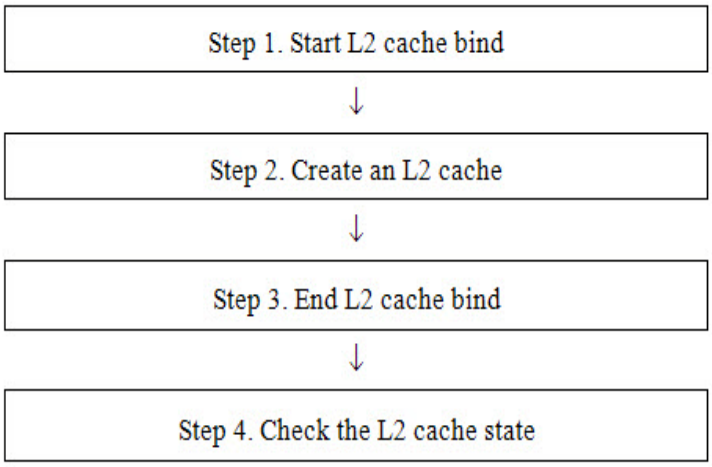

Figure 4-1: Procedure for Initial Configuration

Start L2 cache bind

On the main window of the SnapSAN Manager client (Web GUI), select a disk array in which to create an L2 cache, and select [Configuration] - [L2 Cache] - [L2 Cache Bind] to st

Create an L2 cache

After the [L2 Cache Bind] wizard starts, specify the following and create an L2 cache:

L2 cache type (Read/Write or Read only)

Physical disks (SSD disks) to be used to configure the L2 cache

End L2 cache bind

End the L2 cache bind, and resume disk array monitoring.

Step 4. Check the L2 cache state

Displays the detailed information about the disk array in which the L2 cache was bound on the SnapSAN Manager client. Confirm that the L2 cache state is normal

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Confirming Effects of Read Cache Installation

This section describes the procedure for checking that the read cache of the L2 cache is used effectively, by using AutoTune, after installing the read cache of the L2 cache.

It is assumed that the license for Performance Monitor is unlocked and accumulation of metrics of the disk array is started already.

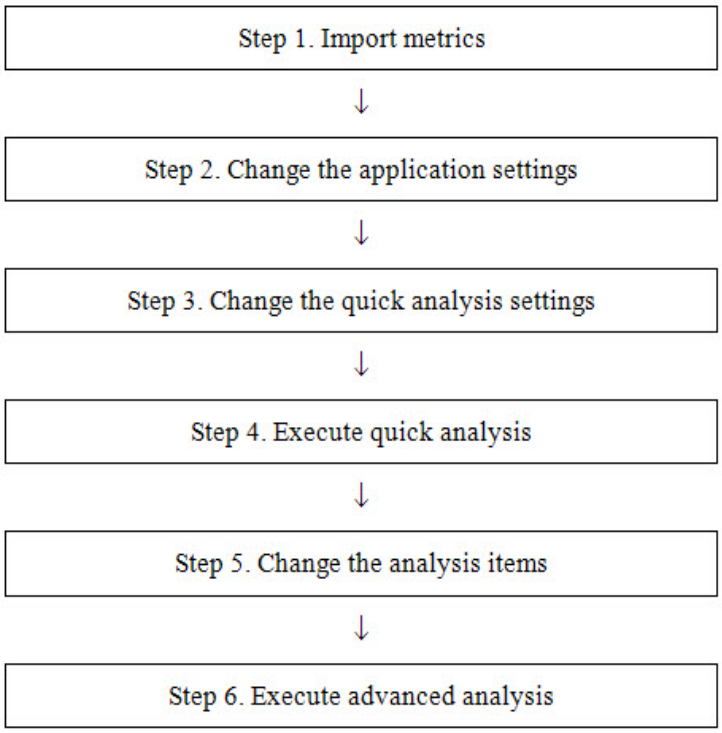
Step 1. Import metrics
Step 2. Change the application settings
Step 3. Change the quick analysis settings
Step 4. Execute quick analysis
Step 5. Change the analysis items
Step 6. Execute advanced analysis

Figure 4-2: Procedure for Confirming Effects of Read Cache Installation

Follow the procedure:

1. Import metrics

   Collect the accumulated metrics of the disk array by using Performance Monitor. Start AutoTune, and in [Import Data], import the collected metrics of the disk array.

2. Change the application settings

   To analyze the metrics of the caches, change the resource and metrics type to [Advanced] mode in [Application Settings] of AutoTune, and restart AutoTune. If [Advanced] mode is set already, this step is not necessary.

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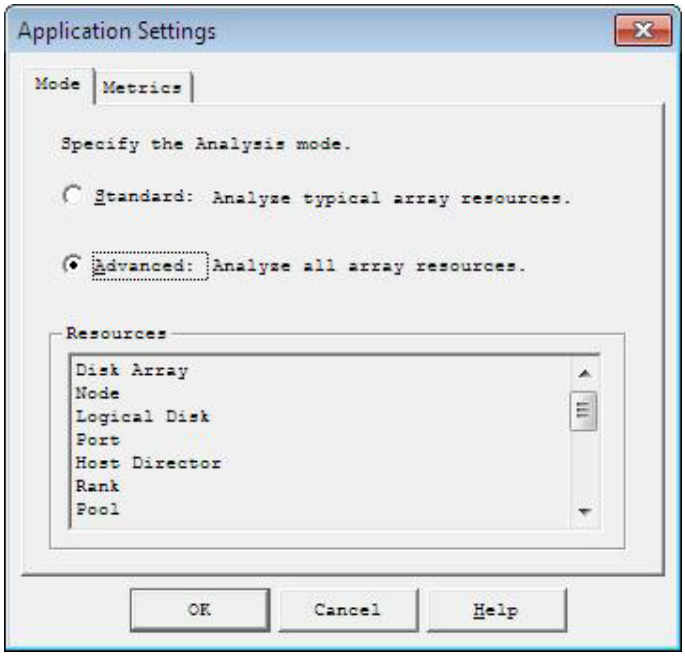

Figure 4-3: Auto Tune [Application Settings] [Mode] Tab

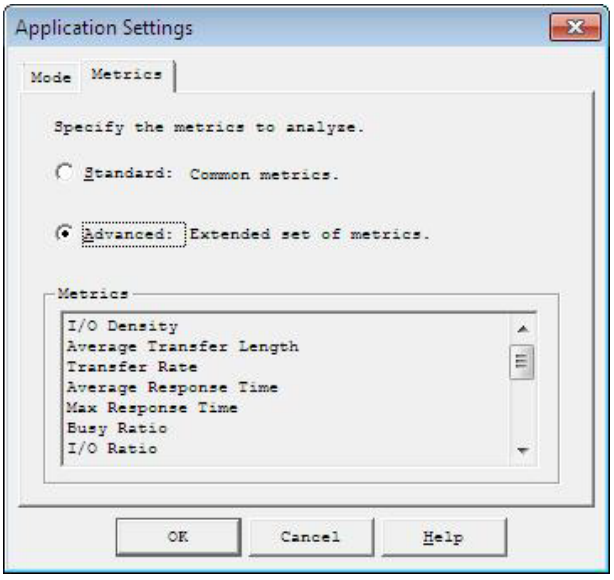

Figure 4-4: Auto Tune [Application Settings] [Metrics] Tab

3. Change the quick analysis settings

   In [Configure Quick Analysis], set the default template for the L1/L2 cache hit ratio of the cache to be displayed in quick analysis.

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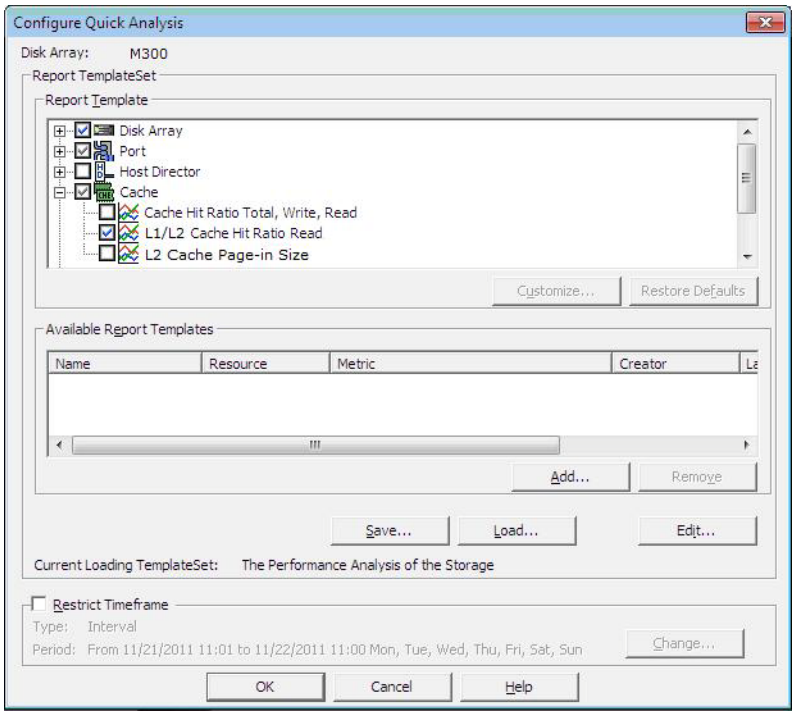

Figure 4-5: Auto Tune Configure Quick Analysis

4. Execute quick analysis

   Execute [Quick Analysis]. The L1/L2 cache hit ratio graph is displayed. (In this example, it is executing the quick analysis by the hourly summary.)

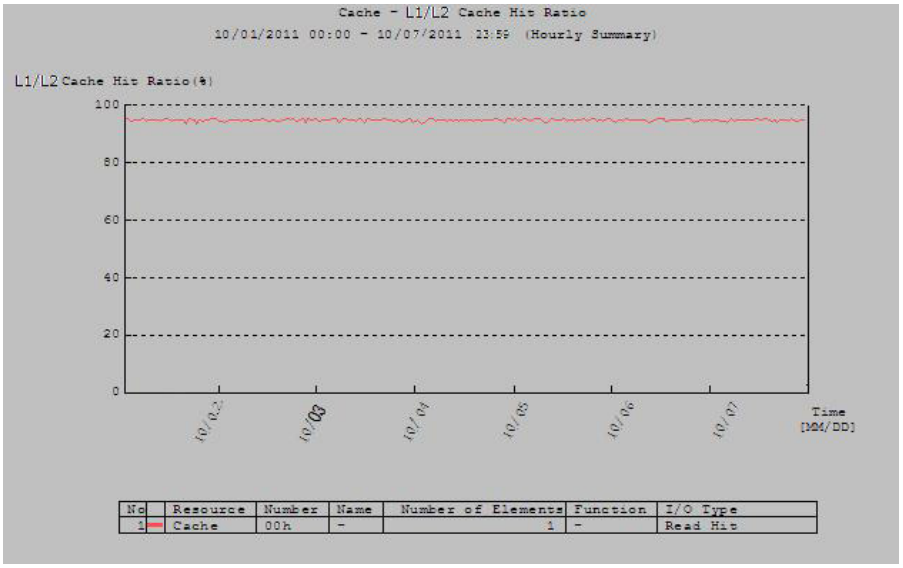

Figure 4-6: AutoTune Graph Showing L1/L2 Cache Hit Ratio

5. Change the analysis items

   In [Configure Settings], add the hit ratio (Read Hit) to the metrics to be displayed on a graph.

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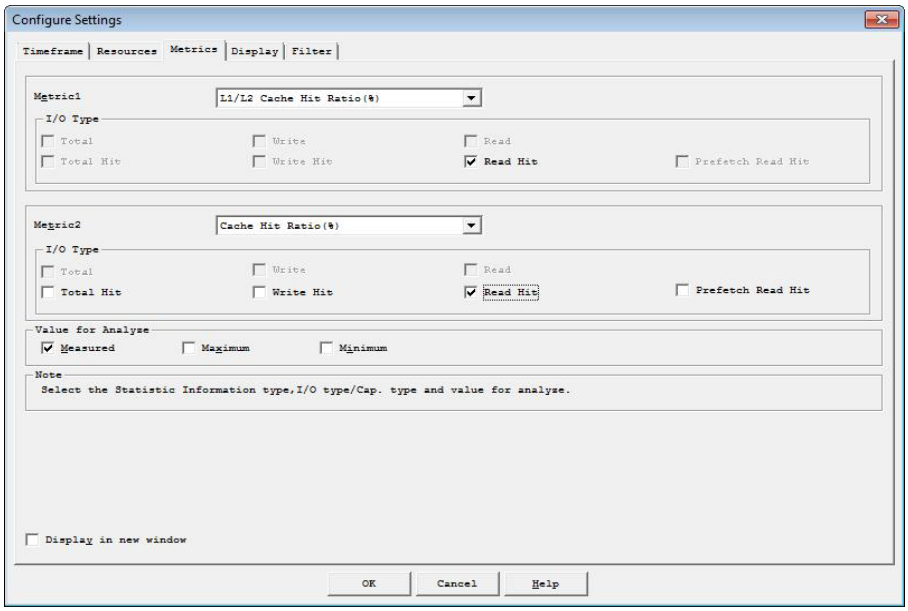

Figure 4-7: AutoTune Configure Settings

6. Execute advanced analysis

   The L1/L2 cache hit ratio and L1 cache hit ratio (Read Hit) are displayed on the same graph. If the L2/L2 cache hit ratio is higher than the L2 cache hit ratio (Read Hit) in any time interval, the L2 cache was efficiently used in the time interval. Efficient use of the read cache of the L2 cache improves the response to read requests.

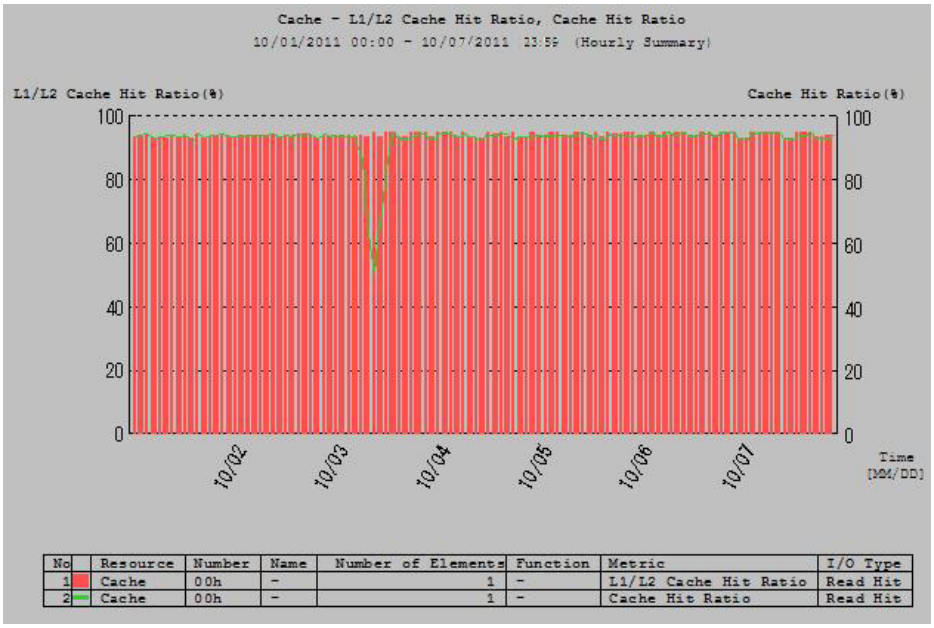

Figure 4-8: AutoTune Graph Showing L1/L2 and L1 Cache Hit Ratio

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Confirming Effects of Write Cache Installation

This section describes the procedure for checking that the write cache of the L2 cache is used effectively, by using AutoTune, after installing the write cache of the L2 cache. It is assumed that the license for Performance Monitor is unlocked and accumulation of metrics of the disk array is started already.

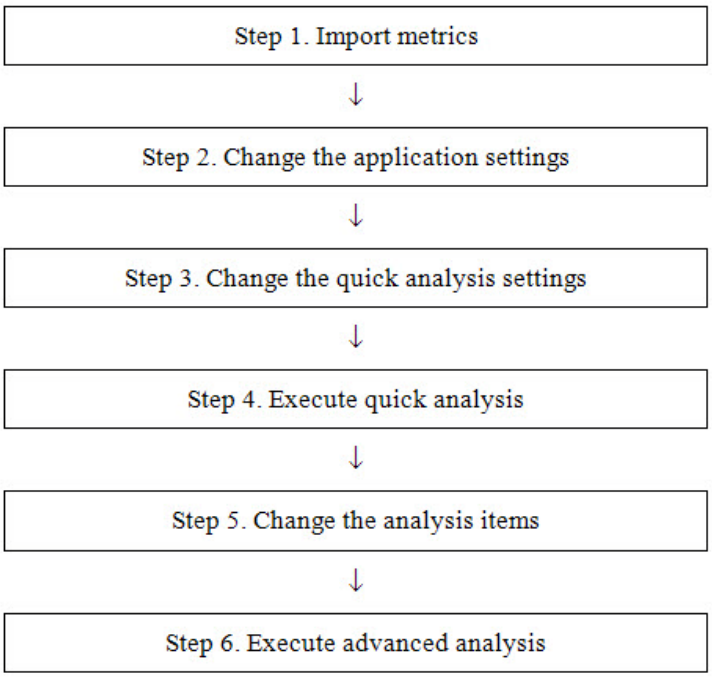
Step 1. Import metrics
Step 2. Change the application settings
Step 3. Change the quick analysis settings
Step 4. Execute quick analysis
Step 5. Change the analysis items
Step 6. Execute advanced analysis

Figure 4-9: Write Cache Installation Confirmation

Change the quick analysis settings

In [Configure Quick Analysis], set the default template for the cache hit ratio to be displayed in quick analysis.

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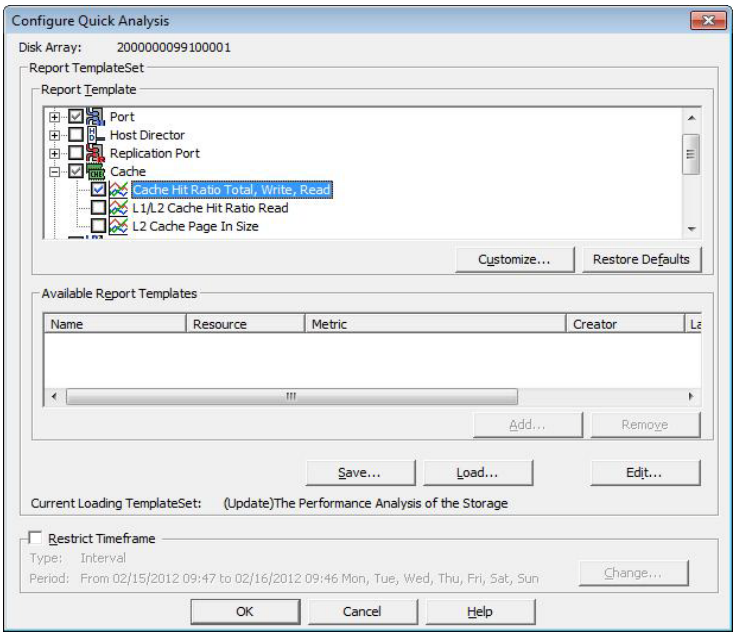

Figure 4-10: AutoTune Configure Quick Analysis

Execute quick analysis

Execute [Quick Analysis]. The L1 cache hit ratio graph is displayed. When the L2 cache hit ratio (Write) is 100%, all write requests have been processed by the L1 cache and the L2 cache has not been used. (In this example, it is executing the quick analysis by the hourly summary.)

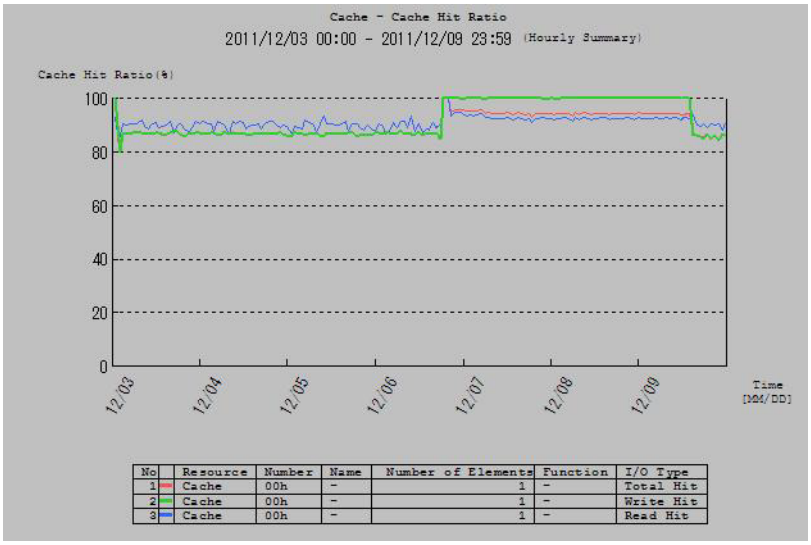

Figure 4-11: AutoTune Graph Showing L1 Cache Hit Ratio

Change analysis items

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In [Configure Settings], change the metric to be displayed to the L2 cache average dirty pages.

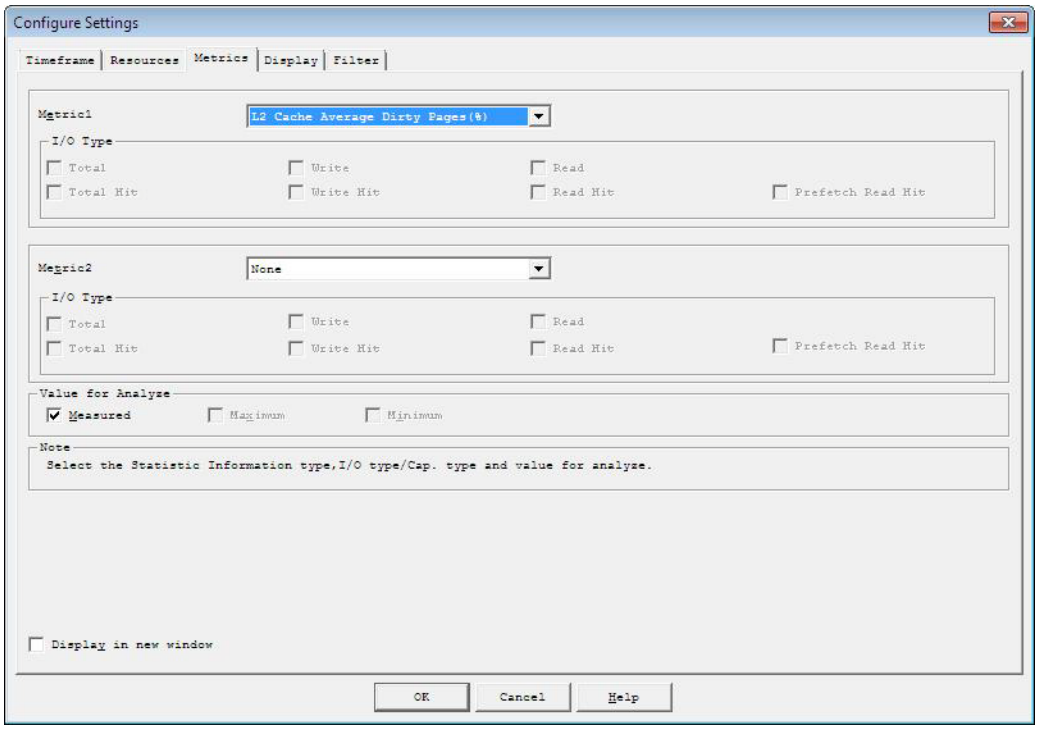

Figure 4-12: Auto Tune Configure Settings

Execute advanced analysis

If the ratio of the L2 cache average dirty pages is larger than 0%, the write cache of the L2 cache has been used. Efficient use of the write cache of the L2 cache improves the response to write requests when the L1 cache hit ratio (Write) is less than 100%.

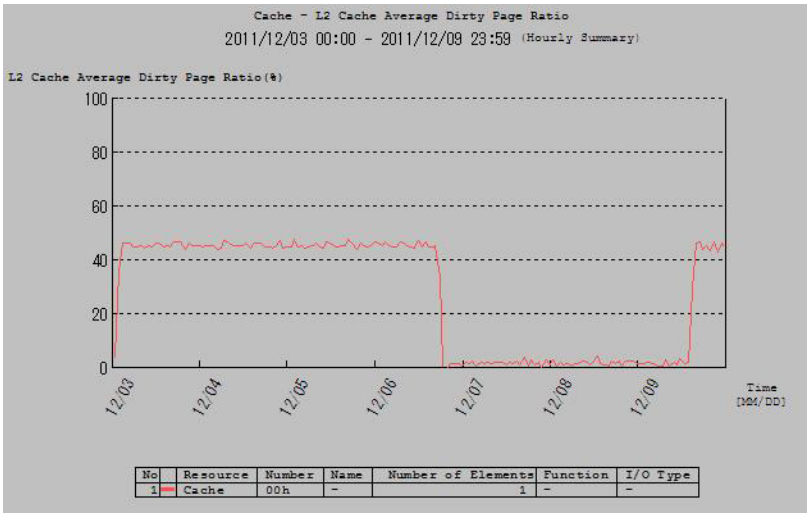

Figure 4-13: AutoTune Graph Showing L1 Cache Avg Dirty Pages

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Checking for the Read Cache Usage

This section describes the procedure for checking for the usage of the read cache of the L2 cache, by using AutoTune, after installing the read cache of the L2 cache.

It is assumed that the license for Performance Monitor is unlocked and accumulation of metrics of the disk array is started already.

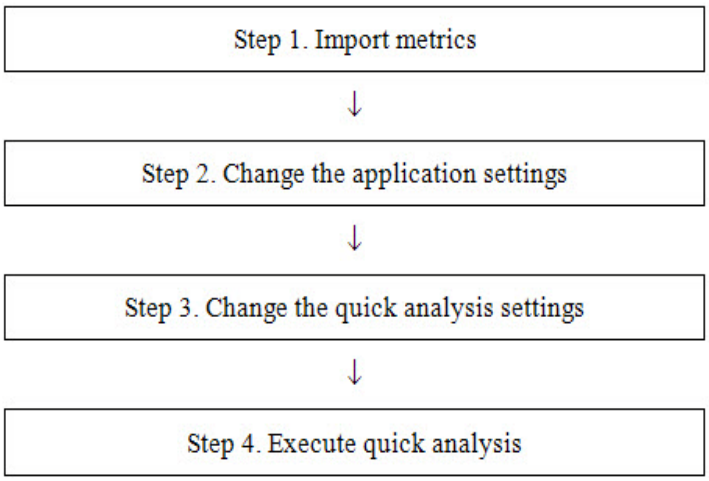
Step 1. Import metrics
Step 2. Change the application settings
Step 3. Change the quick analysis settings
Step 4. Execute quick analysis

Figure 4-14: Procedure for Checking for the Read Cache Usage

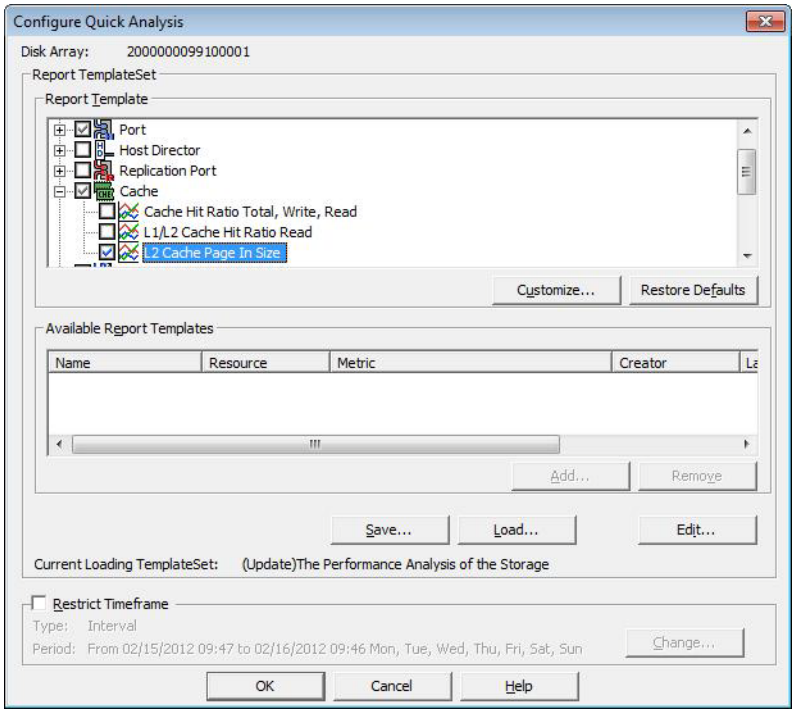

Figure 4-15: AutoTune - Configure Quick Analysis

Execute quick analysis

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Execute [Quick Analysis]. (In this example, it is executing the quick analysis by the hourly summary.) If the L2 cache page-in size is large, and L2 cache produces less effect, it may be possible to use the read cache of the L2 cache more efficiently by increasing the L2 cache capacity.

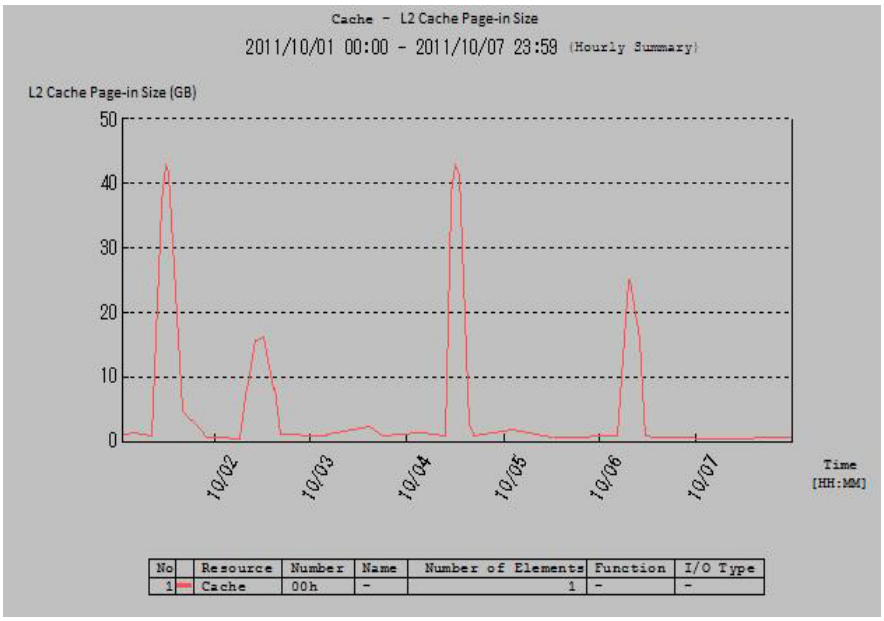

Figure 4-16: AutoTune Graph Showing L2 Cache Page-in Size

Checking for the Write Cache Usage

This section describes the procedure for checking for the usage of the write cache of the L2 cache, by using AutoTune, after installing the write cache of the L2 cache. For how to operate AutoTune, refer to the "Performance Analysis User's Manual".

It is assumed that the license for Performance Monitor is unlocked and accumulation of metrics of the disk array is started already

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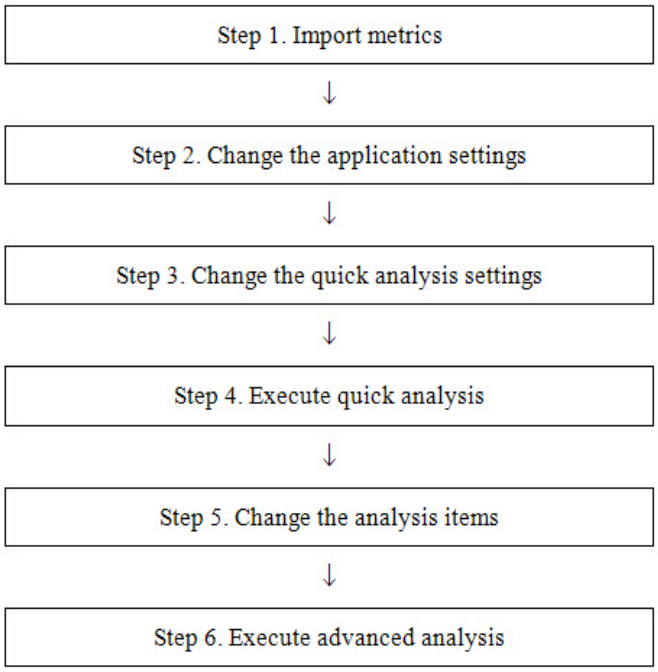
Step 1. Import metrics
Step 2. Change the application settings
Step 3. Change the quick analysis settings
Step 4. Execute quick analysis
Step 5. Change the analysis items
Step 6. Execute advanced analysis

Figure 4-17: Procedure for Checking for the Write Cache Usage

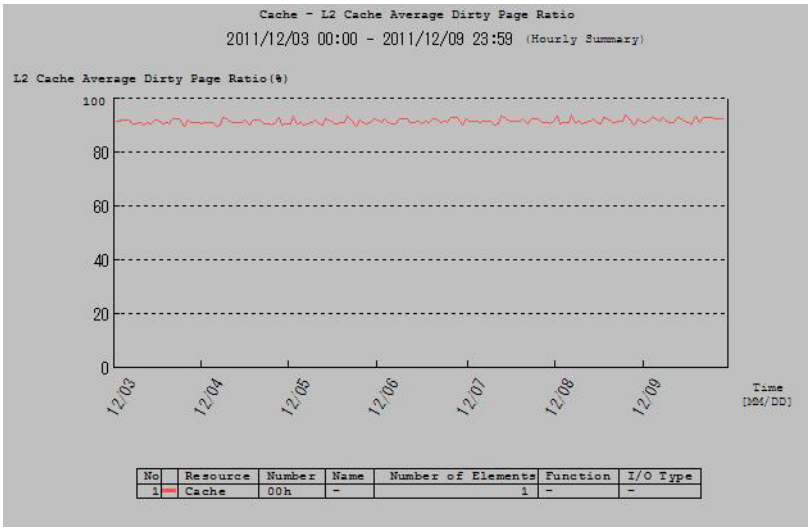

Figure 4-18: AutoTune Graph Showing L2 Cache Average Dirty Pages

Expanding the Capacity

This section describes the procedure for expanding the capacity of the L2 cache through configuration setting on the SnapSAN Manager client (GUI), after installing the L2 cache.

The L2 cache function must be stopped before expanding the L2 cache capacity. Note that the I/O response may be decreased by stopping the L2 cache function. Therefore, it is recommended to implement work in the low time zone of the load.

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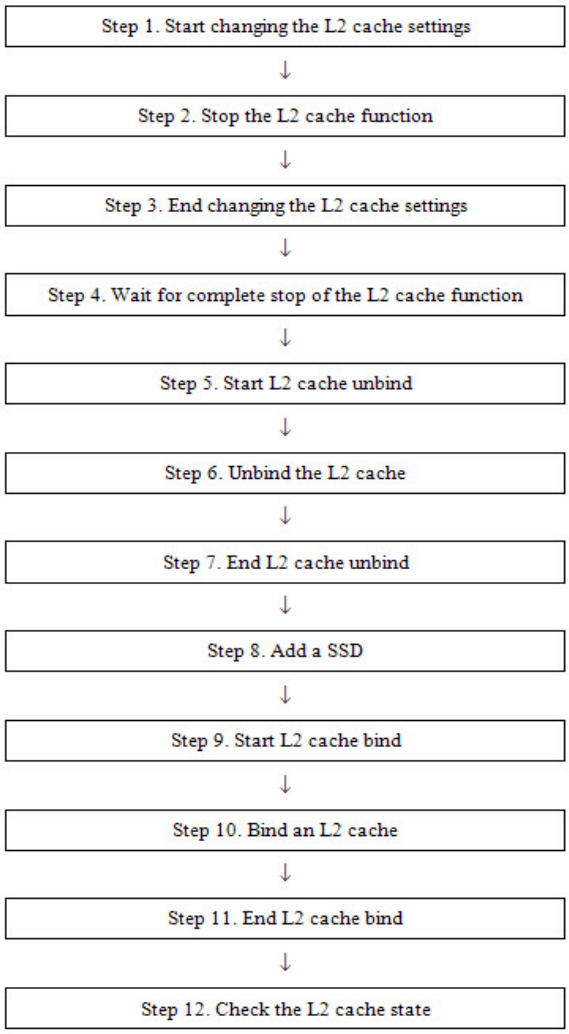
Step 1. Start changing the L2 cache settings
Step 2. Stop the L2 cache function
Step 3. End changing the L2 cache settings
Step 4. Wait for complete stop of the L2 cache function
Step 5. Start L2 cache unbind
Step 6. Unbind the L2 cache
Step 7. End L2 cache unbind
Step 8. Add a SSD
Step 9. Start L2 cache bind
Step 10. Bind an L2 cache
Step 11. End L2 cache bind
Step 12. Check the L2 cache state

Figure 4-19: Procedure for Capacity Expansion

Handling When L2 Cache Is Degraded

This section describes the restoration procedure to be taken when a failure occurs in one physical disk composing the L2 cache and the redundancy of the L2 cache is lost after the redundant L2 cache is installed.

During restoration processing of the L2 cache, the I/O response sometimes declines. Therefore, it is recommended to implement work in the low time zone of the load.

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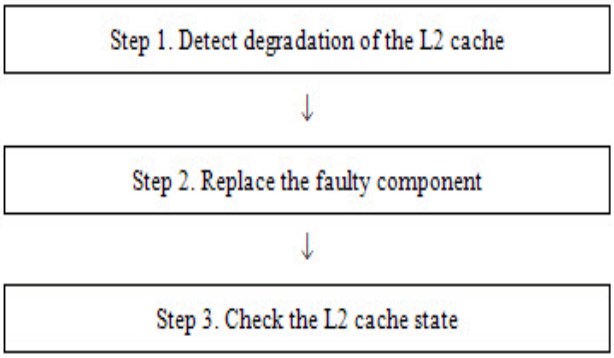

Figure 4-20: Procedure to Be Taken When L2 Cache Is Degraded

1. Detect degradation of the L2 cache

   Since a message (SnapSAN Manager07642) indicating that the L2 cache was degraded is displayed, you can find that the L2 cache entered degraded state (in other word, the redundancy of the L2 cache was lost). At the same time, a message indicating that the state of the resource making up the L2 cache was changed is also displayed.

2. Replace the faulty component

   Replace the faulty physical disk. When the process to restore the L2 cache starts, a message (SnapSAN Manager07643) indicating the L2 cache is during restoration processing is displayed.

3. Check the L2 cache state

   On the completion of restoring the L2 cache, a message (SnapSAN Manager07640) indicating the L2 cache was restored is displayed.

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Notes

Notes for L2 Cache

General notes for using the L2 cache function are described below.

- The data on the logical disks in a normal pool that is configured on SSD disks are not stored in the L2 cache.
- If the read cache on a logical disk is set to disabled, the L2 cache on that logical disk is also disabled.
- One L2 cache can be created per disk array.
- The rated number of physical disks that can be set for L2 cache is four. But, in the case of the read only, it is two.
- In the L2 cache pool, three logical disks for the L2 cache are bound. A normal logical disk cannot be created in the pool dedicated to L2 cache.
- Operations that are not related to L2 cache cannot be performed on the logical disks dedicated to L2 cache.
- L2 cache cannot be created on the physical disk in which the disk array configuration information is saved.

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Flex License

For a copy of the license see:

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Index

A

advanced settings for L2 cache bind **2-6**
AutoCache **3-1**

C

Cache module list **2-14**
Change of L2 cache settings **2-1**
Checking for the Read Cache Usage **4-9**
Checking for the Write Cache Usage **4-10**
Confirming Effects of Read Cache Installation **4-2**
conventions, typographical **PR-iv**
customer support **PR-iii**

E

expanding the L2 cache capacity **4-11**

H

Handling When L2 Cache Is Degraded **4-12**

I

iSMcfg l2cachebind **2-2**
iSMcfg l2cacheunbind **2-2**
iSMcfg nickname **2-2**
iSMcfg setl2cacheattr **2-2**

L

L1/L2 cache hit ratio **2-14, 4-3**
L2 Cache **4-1**
L2 cache average dirty pages **4-8**
L2 cache bind **4-1**
L2 cache configuration **1-2**
L2 cache information display **2-1**
L2 cache maximum dirty pages **2-15**
L2 Cache On/Off for Each Logical Disk **2-12**
L2 cache on/off for each logical disk **2-2**
L2 cache page-in size **2-14**
L2 Cache Performance Analysis **2-2**
L2 cache performance analysis **2-1**
L2 Cache pool **2-6**
L2 Cache Settings **2-2**
L2 Cache Type **2-5**
L2 Cache Types **1-2**
logical disk for L2 Cache **2-7**

N

name for the L2 cache pool **2-7**
name for the logical disk for L2 cache **2-7**

O

Overland Technical Support **PR-iii**

P

Persistent write **1-1**
persistent write **1-1**
physical disk **2-3**
Physical disk list **2-14**
product documentation **PR-iii**

R

Read Cache **4-2**
Read only **1-2**

S

SnapSAN Manager **2-13**
software update **PR-iii**
SSD **2-4**

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T

technical support **PR-iii**
Total Capacity **2-14**
typographical conventions **PR-iv**

W

Write Cache **4-6**
write cache **2-15**

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